Normal Parameters of Occlusion in Children*

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INTRODUCTION AND JUSTIFICATION OF THIS RESEARCH

From the times of Hesires, the Egyptian, 3,000 years B.C. and perhaps even before, humanity has been concerned about problems inherent to oral health.

Among all the vital systems of the individual's life, the masticatory system has received special attention. There have been many men, who have shaped techniques, philosophies and research methods searching for better attention to provide better health.

On the other hand, during the last two centuries, prevention has gained more importance day by day because it is from this point where we can impede disease from appearing in order to meet the long expected wish of a human race free of pathologies.

The earlier these preventive methods are applied in a man's life, the more efficient the results will be. This has led us to look towards children, who are just beginning their everyday life, as the ideal subjects for the application of these measures.

Among the innumerable research systems, all of them very important, we must mention one that is not common and not well known in general, and has certainly proven its excellent qualities. We are referring to Pantography, or the system to visualize through tracings, the condyle and mandibular physiology to relate it to other aspects of the gnatic system.

The dental profession could never imagine, when at the beginning of the 17th century, Christopher Scheiner, a German Jesuit, mathematician and philosopher, published the basic principles of

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pantography, that this new science could launch vital lights in search for the longing desire of oral health.

Several years have gone by, many ideas have emerged since then; perhaps many mistakes have been made, but scientific investigation continues to establish the parameters for daily practice. This combination, scientific research corroborated by clinical experience, has still proven to be the ideal solution to overcome the innumerable problems that the profession is facing today.

At present, all the knowledge about occlusion of teeth in their static and physiological form are highly qualified and there is a major trend towards the search for unanimity in general concepts. Unfortunately, almost everything we know, discuss, investigate and prove, refers only to adult patients.

In this aspect, children have been totally neglected. Many problems related to occlusion referring to the stomatognatic system are being solved, but very little is being prevented. When the question arises of how children's teeth occlude, specially during mixed dentition, and what are the consequences of this occlusion with regards to the other components of the system, either there are no adequate answers or a very simplistic explanation is given, referring to the development of the maxilla and mandible or explaining in detail the chronology of dental eruption.

Another problem we usually face, not only dealing with children but in all aspects of the profession, is that certain beliefs or philosophies, stated long time ago, have not been reappraised nor questioned, and they are still being held as true. A typical example: It has always been stated that children who have a mixed dentition cannot have fixed or established positions, due to the fact that the superior wall of the glenoid cavity is completely flat. What a big mistake! According to Hinton (1981): "At birth, the articular surface of the temporal bone is practically flat, considering that the articular eminence and the post-glenoideal process are not completely developed, because the typical S profile characteristic of the adult joint is missing. However, between 6 months and 2 and a half years of age, the mandibular fossa increases its depth from less than 2 mm up to 4 or 5 mm (Wright and Moffett, 1974).

"Most of the researchers agree (excepting Humphreys, 1932) that a "contour as in an adult" is initially established during this period; for example, during the development of the primary denti-

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LITERATURE REVIEW

Several references are found in dental literature regarding the use of pantographic tracings in adult patients to determine normal standards.

Hernández et al. (1981) presented a good epidemiological sample taken mainly from students of the School of Dentistry whose ages varied between 18 and 20 years, comparing the pantographic tracings obtained before and after having used jaw splint therapy. They also presented interesting history of pantography since its very beginning in 1603.

Clayton and his collaborators (1976), present the so called P.R.I. "PANTOGRAPHICAL REPRODUCTIVENESS INDEX", which along with the ANAMNESTIC AND CLINICAL INDEX OF OCCLUSIVE DYSFUNCTION, more commonly called the HELKIMO INDEX proposed by Helkimo (1974), provides a measure in terms of the severity or normality of the occlusive conditions of a patient.

Crispin et al. (1978) reported a significant reduction in the variability of the Pantographic Reproduction Index as a result of the jaw splint therapy.

Shields and his collaborators (1978) state that a measure of the reproduction of the pantographic tracings can help to detect the lack of coordination and the dysfunction of the T.M.J.

On the other hand, we already mentioned Hinton's study (1981)
about the normal anatomic characteristics in T.M.J. in children between 3 and a half and 4 years of age, insisting that at this age, the joint almost has the characteristics of any adult joint.6

In a thesis presented at the School of Dentistry of the Pontificia Universidad Javeriana of Bogotá, López and his collaborators (1983) formulate very interesting conclusions using pantographic tracings, making a comparison before and after having used the jaw positioning splint therapy, in adolescent patients between the ages of 7 and 14 years of age. It is interesting to note their findings regarding the position of centric relation in these young patients. Almost without exception, they repeat this position after the symptoms have been eliminated.

It would be an endless job to mention all the bibliography available, which stresses the need to apply preventive and interceptive measures on patients, the younger the better, in order to obtain a correct craniofacial development and avoid problems in adulthood.

After the termination of this investigation, a text was published by Hosl et al. (1985)7 where one of this collaborators, Professor Siegfried Kulmer, of the Department of Periodontics, School of Dentistry, University of Innsbruck, Austria, in a chapter called "Periodontics, Orthodontics and Restorative Dentistry" (1985) under the subtitle of Scientific Backgrounds, states: "The best method established to control Centric Occlusion is to determine centric relation8; Richter found in children between 3 and 6 years of age, a clear and perfectly reproducible Centric Relation especially a terminal therapeutic hinge axis."9

"Kulmer recorded this therapeutic hinge axis in 91.77% of a sample on 108 children and adolescents between 6 and 16 years of age.10 Of the patients that were used in this study, 8.3% presented serious problems of the T.M.J. and masticatory system; most of them presented pain, which made it impossible to record the rotation axis, 93.5% of the patients presented retrusive wear facets which clearly showed that the centric relation was a functional position."

**MATERIALS AND METHODS**

Ten patients were selected for this investigation, whose ages ranged between 5 and 12 years of age. Certain characteristics such as sex and other factors of normality or abnormality were not taken into consideration. Each one of these young patients were treated as follows:

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* Kinematic Positioner, Denar Corporation 2220 Howell Ave, Anaheim, California, 92806, U.S.A.
1) A location of the hinge axis was obtained, using an appropriate positioner.*
   For this purpose, clutches or individual trays were constructed for each patient, using a self curing resin.

2) After having located the posterior rotation kinematic axis, the corresponding tattoo was made on the skin, using black dye and a disposable anesthesia needle.

3) Two pantographies were made on each patient, recording the same movement twice in a consecutive manner. Because in the Denar System* the tracings are recorded on special adhesive papers placed on the corresponding plates, the paper was changed every two tracings for future reference and comparison.

The first two tracings were made under the induction of the operator and the second ones were freely made by the patient. The term INDUCTION means that the operator, under certain pressure, guides the movements.

It is important to note that the patients did not receive any type of relaxing or repositioning therapy before the study. Just before the pantographies were made, they received a short explanation on how to move their mandible.

4) Complete Clinical Records Including:
   a) Clinical examination of the intra and extraoral soft and hard tissues.
   b) Anamnesis. — This was taken not only of the natal life of the patient but, by inquiries to the mother, of the prenatal life. Emphasis was made on noting the nutritional and positional habits of the patients.
   c) Complete set of periapical X Rays.
   d) Cephalometric radiographs and the corresponding cephalometric analysis using the Steiner method.
   e) Diagnostic casts properly mounted on a Whip-Mix semi-adjustable articulator.**
   f) Functional Analysis of occlusion, with the help of the articulated diagnostic casts and the application to the patient of the Helkimo Index, and in the pantographic tracings, the PRI — Index.

The mixed dentition analysis of the University of Alabama was applied as well, to determine the space required for permanent canines and premolars.

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* Standard Pantograph Denar Corporation 2220 Howell Ave. Anaheim, California, 92805, U.S.A.

** Whip-Mix Corporation. 361 Farmington Avenue. P.O. Box 17183 Louisville K.Y. 40217, U.S.A.
DISCUSSION

The general conclusions were based on an individual analysis of the patients. As an example, and for the sake of saving space and time, we will only mention one case.

Patient No. 1:
— Presents lateroprotrusive mandibular deflection.
— There is no cuspid protection
— There are premature contacts on the working side as well as on the non working side.
— During the protrusive movement there are interferences of the posterior teeth.
— There is a better percentage of pantographic reproductivity on the non-induced tracings.
— In the progressive Bennett movement, on the right side, there is a wider angulation of the induced tracings; it does not show an immediate Bennett movement. The protrusive tracing is defective.
— There is wear on the canines on the left side; there are no teeth on the right side (mixed dentition).
— No cross-bites exist but the relationship is almost edge to edge.
— Greater mandibular development.
— Arthub sucking habit existed as well as a nail biting one.
   Between the mounting of the diagnostic casts and the cephalometric analysis (8 months difference), the habit was eliminated resulting in an almost totally closed anterior open bite.
— There was moderate pain when jiggs were used.
— The Helkimo Index indicated a degree of 1 moderate reduction of the function.
— The results of the cephalometric analysis showed:
   1) Mandibular retroinclination which produces a reduced vertical dimension of the ramus.
   2) Increased vertical relationship of the mandible and maxilla.
   3) Slight retrusion of the maxillary alveolar process.
   4) Bimaxillary Protrusion.
   5) Distal displacement of the first mandibular molar in relation to the first maxillary molar (Class II relationship).

CONCLUSIONS

It is really difficult to obtain definite conclusions from this investigation for a few reasons:

1. Perhaps the results in the number of patients studied (10) does not give us general guidelines.

2. The difficulties in dealing with very young patients. Children are somehow apprehensive towards adults, especially if there is no family relationship.

3. The lack of experience of the authors.
Each step taken in this investigation was improvised since there was no background due to the lack of comparative studies in order to design parameters of normality or abnormality.

Nevertheless, the authors of this investigation observe definite patterns which are presented for discussion and may be used as the basis for further studies, so that in the near future more will be known about the occlusal aspects in children, in order to provide better oral health to these young patients.

1) It is worth mentioning, in the first place, that in spite of all discussions regarding the characteristics of the temporomandibular joint in children (completely flat superior wall of the glenoid fossa and other similar peculiarities), a high percentage of children (9 out of 10 cases studied) repeat centric relation. This was confirmed during the induced (operator applying pressure) and voluntary movements of the patient.

2) Better pantographic tracings were observed in a high percentage of the voluntary movements of the patient than in the movements induced by the operator. In adult patients the opposite is observed unless an ideal health status exists. This might be interpreted as a situation where the muscles, ligaments, nervous system etc. have not been compromised although some of these

<table>
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<th>Patient</th>
<th>Bruxism</th>
<th>Helkimo Index</th>
<th>PRI Index</th>
<th>Deflection</th>
<th>Incisive Protection</th>
<th>Canine Protection</th>
<th>Canine Facts</th>
<th>Inmed. Bennett</th>
<th>Pain with jiggs</th>
<th>latrop' genesis</th>
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<td>1</td>
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Patient No. 6 does not repeat centric relation.
youngsters already show certain degree of iatrogenia.

3) Regarding the so called immediate Bennett Tracing, considered pathological by several authors, it is interesting to note that 8 out of 10 patients started showing it, if not totally defined at least as an apparent sketch.

This tracing does not appear as such in the voluntary movements but it does in those movements induced by the operator.

This tracing is common in adult patients and is due to the action of the protective mechanism of the masticatory system. (Nociceptive reflex).

4) Regarding the previous conclusion it should be pointed out that this immediate Bennett tracing or immediate laterotrusion is always observed in the horizontal posterior plate, which represents the side on which the patient sleeps or on which he places his hand to rest the face, during the day.

Considering that what is observed in the plates is the Bennett angle, we can conclude that the movement itself takes place on the opposite side over which the patient sleeps or has a habit.

Obviously, this problem of the immediate Bennett is seen in each one of the patients that presents pathology, especially referring to occlusal interfering contacts, on the balancing side where there is no activity.

5) We also note that once again, in 8 out of 10 patients when applying the clinical index of mandibular dysfunction proposed by Helkimo, positive values are found indicating problems. Almost all of them show a value of 1 or maximum 2 that indicates a slight dysfunction. Only one patient showed a value of 5 that indicates serious dysfunction. These findings are closely related to the symptoms that occur when jiggs are used.

6) It is important to call to the attention of all dentists, and especially those working with children, that there was a direct relationship between the amount of dental work that the child had received and the problems caused by it; carries, defective fillings, primaturities, extractions without adequate space maintenance and other habits without treatment, were perhaps the most common iatrogenic factors.

7) Finally, and perhaps the most interesting conclusion of this research is the need for a deeper study of all the aspects relating to occlusion early in a child’s life in order to apply the principles of primary prevention.
REFERENCES


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